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STUDENT WORKBOOK

MILITARY ROADS AND AIRFIELDS

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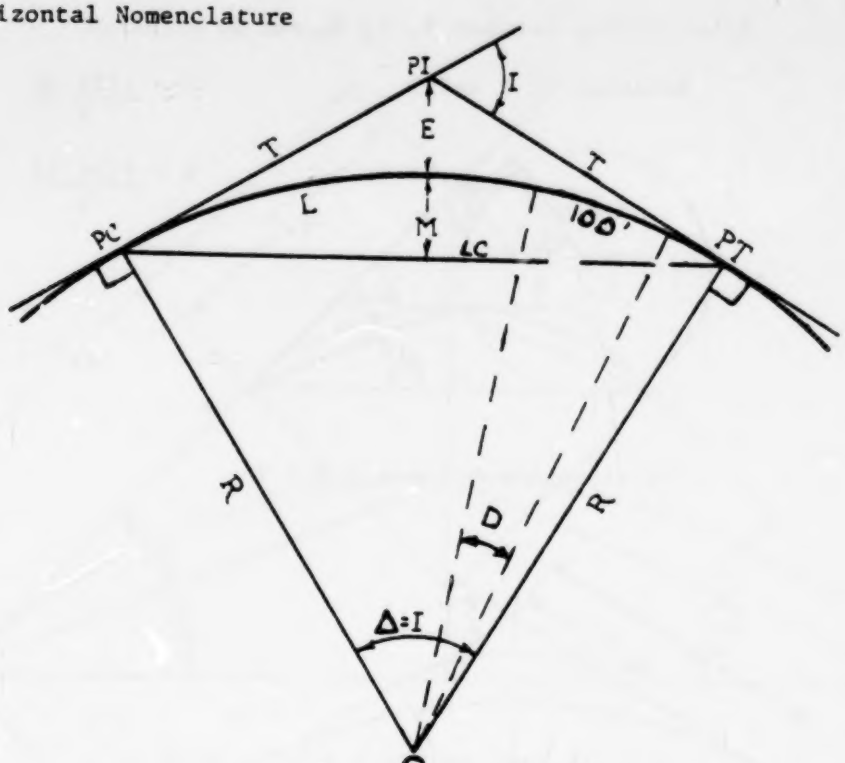
Horizontal Nomenclature



Curve Nomenclature

PI - Point of Intersection of Tangents
PC - Point of Curvature
PT - Point of Tangency
L - Length of Curve
I - Angle of Intersection (and Central Angle)
D - Degree of Curvature (Angle Subtended by a 100 ft Arc)
LC - Long Cord
d - Deflection angle
ℓ - Length of partial station

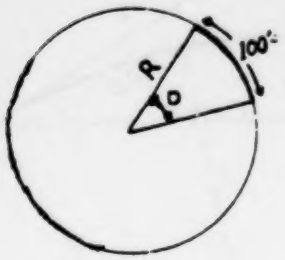
R - Radius of Curve
T - Tangent Length
E - External Distance
M - Middle Ordinate

Relationship between R, D, T, and E.

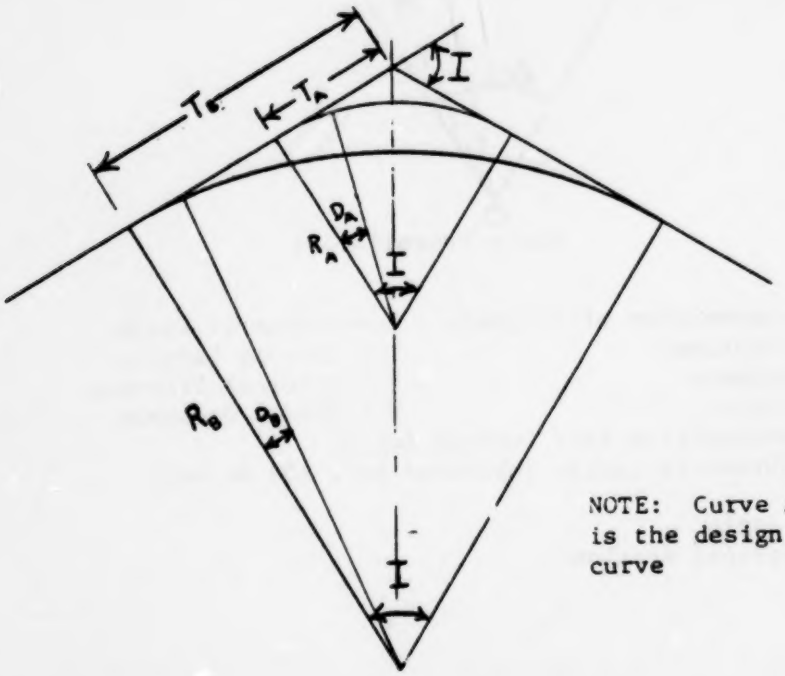
Relation of R and D

$$D = \frac{5729.58}{R}$$

$$R = \frac{5729.58}{D}$$



Relationship between D and T

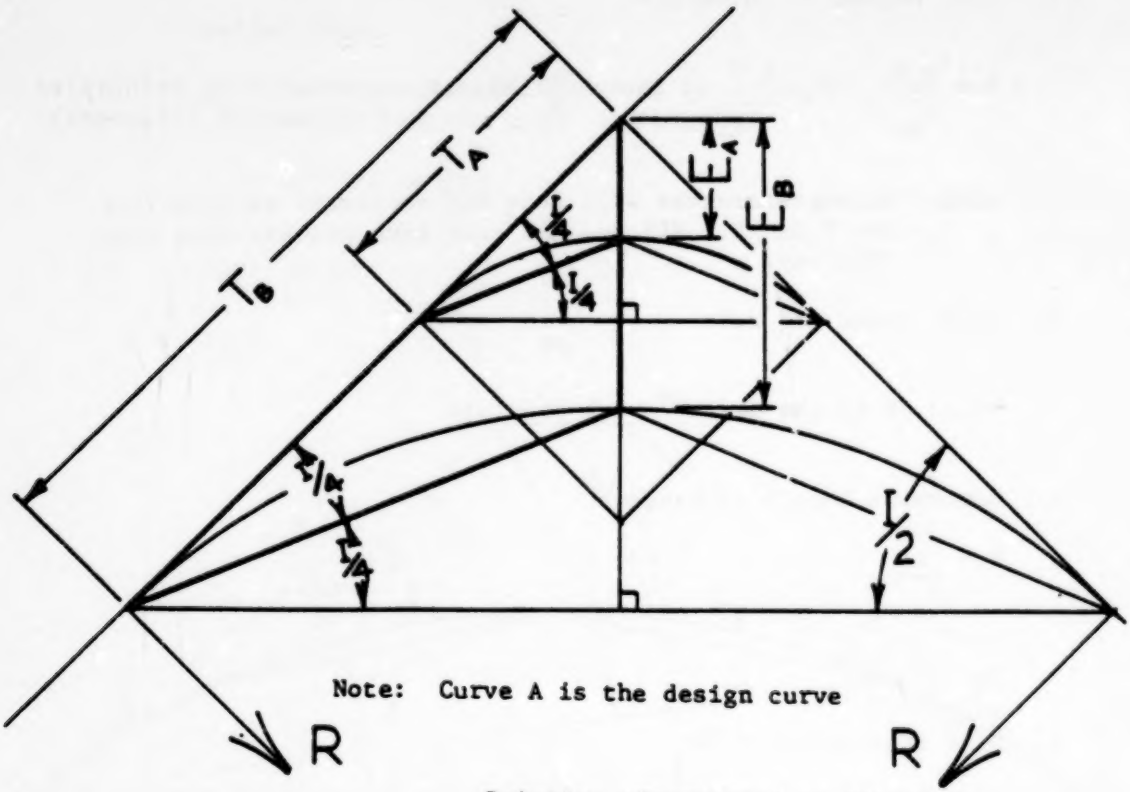


NOTE: Curve A is the design curve

Relationship of tangent to 1°curve

By similar triangles $\frac{TA}{RA} = \frac{T_B}{R_B}$

Relation of D and E



Note: Curve A is the design curve

Relation of external to 1° curve

By similar triangles, $\frac{E_B}{E_A} = \frac{T_B}{T_A}$

One-Degree Curve Method

a. Find degree of curvature

$$D = \frac{T_1^{\circ}}{T_{RES}}; \quad D = \frac{E_1^{\circ}}{E_{RES}}; \quad D = \frac{5729.58}{R}$$ (R selected using principles of horizontal alignment)

NOTE: Other references will show MAX (maximum) as subscript for T and E. RES and MAX have same meaning when used this way.

b. Apply round off rule

Round UP to the next $\frac{1}{2}^{\circ}$ <u>when possible</u>.

c. Determine length of tangent

$$T = \frac{T_1^{\circ}}{D}$$

d. Find stationing of PC

$$PC = PI - T$$

e. Calculate length of curve

$$L = \left(\frac{I}{D}\right) 100$$

f. Find stationing of PT

$$PT = PC + L$$

g. Adjust tangential stationing to curve stationing

$$PI_{\substack{\text{new} \\ \text{next PI}}} = PI_{\substack{\text{original} \\ \text{next PI}}} - (2T-L)_{\substack{\text{preceding} \\ \text{curves}}}$$

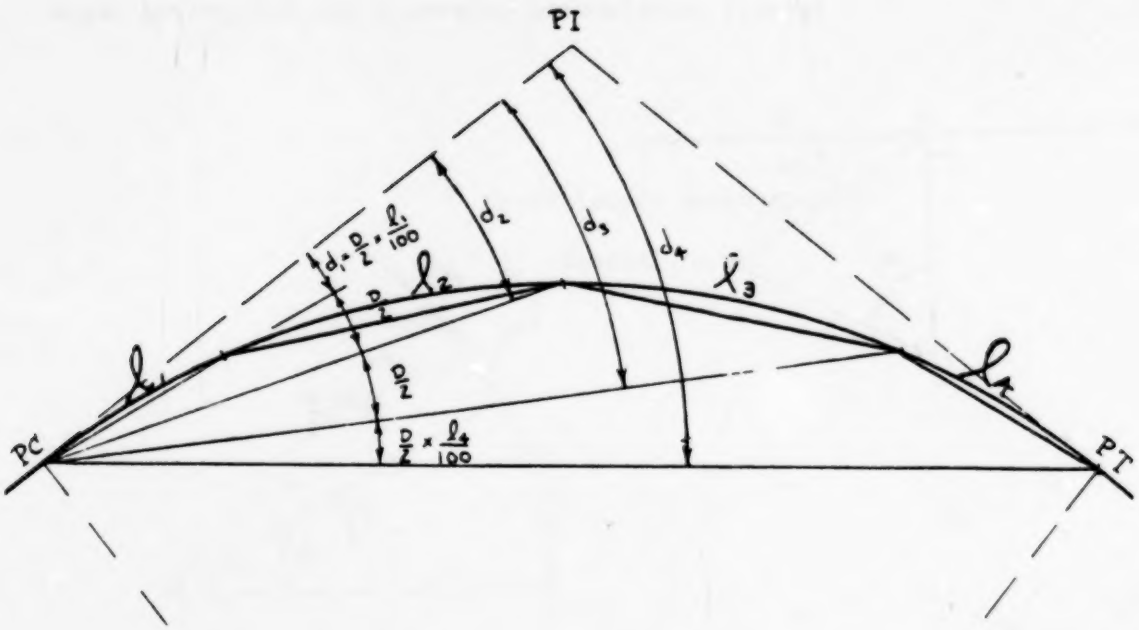
Deflection Angles

Definitions

Deflection angle; ∢ formed by a tangent line and a chord from the point of tangency.

Central angle;

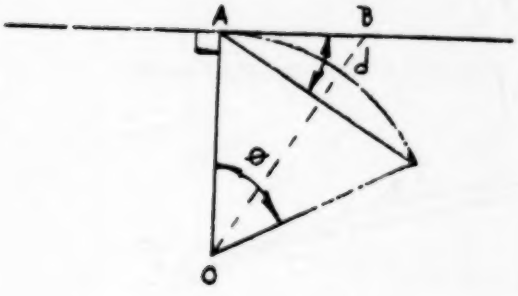
Application



Deflection angle and chord determination

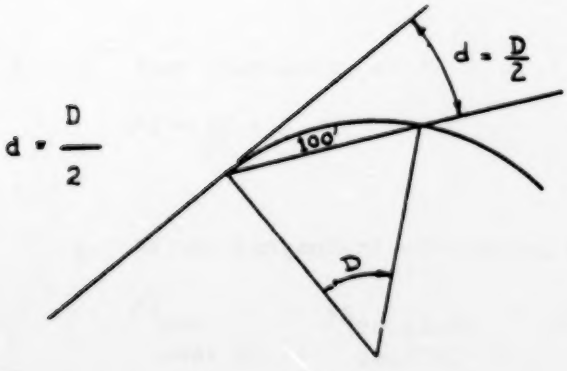
	Deflection Angle
PC to 1st full station	
Full station to full station	
Last full station to PT	

General relationship between d and the central angle

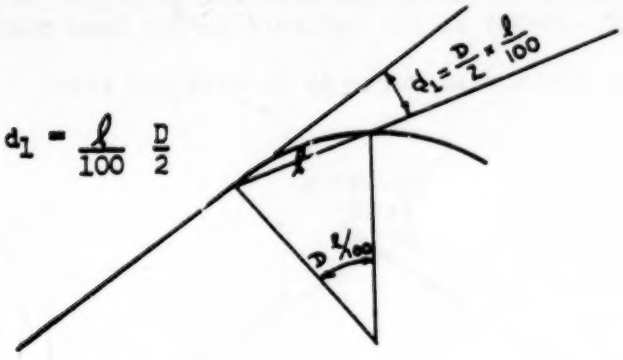


$$d = \frac{\theta}{2}$$

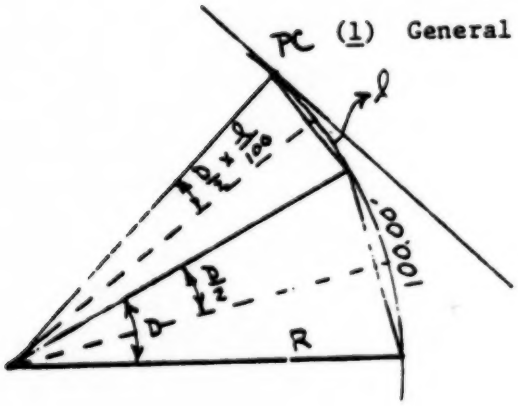
Deflection angle for full station



Deflection angle for partial station
(PC to full station or full station to PT)



Chord length determination



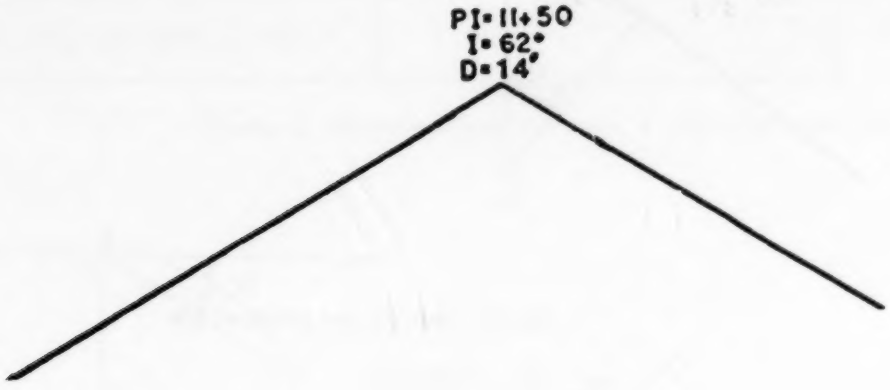
Full station to full station

Chords less than full station*

LEAD-THROUGH PRACTICAL EXERCISE 1

SITUATION: A 14° degree of curvature has been specified for Horizontal Curve #1 (PI 11+50) on the Railroad Access Road plan.

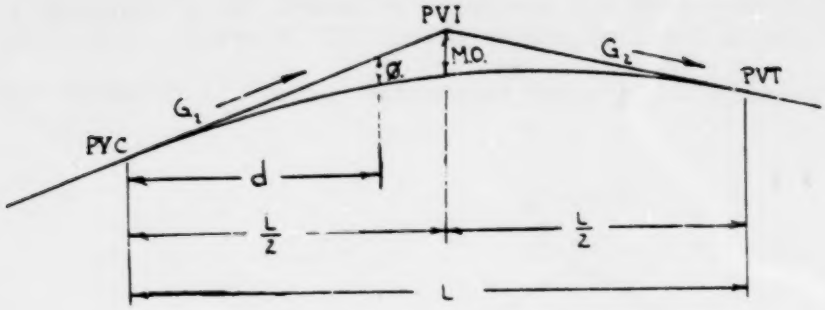
REQUIREMENT: 1: Design Horizontal Curve #1 on attached plan.



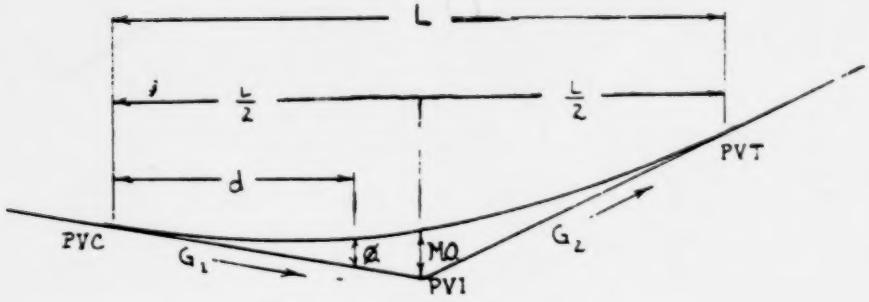
REQUIREMENT 2: Compute the deflection angles and chords required to layout Horizontal Curve #1 in the table below?

Station	Computations	d

Vertical Nomenclature



OVERT VERTICAL CURVE

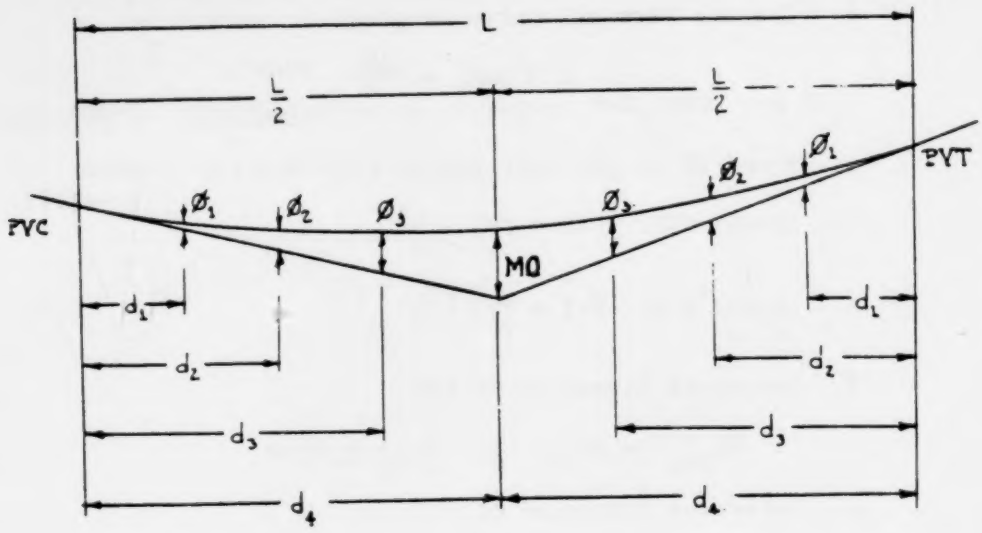


INVERT VERTICAL CURVE

Figure 3-2 Elements of the Vertical Curve

PVI - Point of Vertical Intersection
PVC - Point of Vertical Curvature
PVT - Point of Vertical Tangency
G_1 - Grade in % of Approaching Tangent
G_2 - Grade in % of Departing Tangent
L - Length of Curve (Horizontal Distance from PVC to PVT)
M.O. - Maximum Offset
Ø - Offset; measured a distance "d" from PVC or PVT
d - Distance in stations, from either PVC or PVT, to the point where offset or GLE is measured.

VERTICAL CURVE OFFSETS



M.O. - Maximum Offset. Always occurs at PVI.

d_1, d_2, etc. - Distance, in stations, from either PVC or PVT to the point where offset or GLE is measured.

$Ø_1$, $Ø_2$, etc. - Any intermediate offset, other than MO. It is the elevation difference between the grade line and the actual curve. Normally, it is computed at every half-station and full-station to facilitate layout of the curve.

$Ø = MO \left(\frac{d}{L/2}\right)^2$ - By this equation, it becomes evident that intermediate offsets increase as "d" increases until it achieves a maximum value at the PVI. This is where "d"="L/2". Ø will NEVER be larger than MO.

5. Curve Design Steps:

a. Compute Change of Grade: $G = \left| G_1 - G_2 \right|$

b. Compute Vertical Curve Length;

$$L \text{ (feet)} = \frac{\Delta G}{4} \quad \text{Invert}$$

$$\frac{1.25 \Delta G}{4} \quad \text{Overt}$$

c. Round UP to the next higher full station. (When possible)

d. Locate PVC: $PVC = PVI - \frac{L}{2}^*$

e. Locate PVT: $PVT = PVI + \frac{L}{2}$

f. Determine Elevation of PVC

$$EL_{PVC} = EL_{PVI} \pm \left| G_1 \right| (L/2)^{**}$$

g. Determine Elevation of PVT

$$EL_{PVT} = EL_{PVI} \pm \left| G_2 \right| (L/2)$$

h. Determine Maximum Offset (M.O.)

$$*** \text{ M.O.} = \frac{L \Delta G}{8}$$

i. Determine Final Curve Elevations
- Compute at every half-station and full-station along the curve.

(1) Determine Grade Line Elevation (GLE)

$GLE = EL_{PVC} \pm \left| G_1 \right| \times (d)$ -Valid from PVC to PVI-

$GLE = EL_{PVT} \pm \left| G_2 \right| \times (d)$ -Valid from PVT to PVI-

(2) Determine Intermediate Offsets (Ø)

$$*** \quad \text{Ø} = MO \times \left(\frac{d}{L/2} \right)^2$$

(3) Determine Curve Elevation

Elev Curve = GLE $\pm$ Ø

NOTES: *Substitution for L and d throughout this procedure should be in terms of stations.

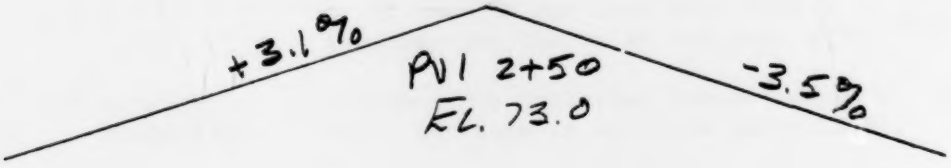
**Substitution for G_1, G_2, or ΔG throughout this procedure should be in terms of %.

***See page 3-20/21 for derivation.

LEAD-THROUGH PRACTICAL EXERCISE 2

SITUATION: Given the profile of the Railroad Access Road, it is desired to determine the minimum length of Vertical Curve #1 with PVI at station 2+50.

REQUIREMENT 1: Determine length of curve, PVC, PVT, and MO



REQUIREMENT 2: Compute the deflection angles and chords required to layout Horizontal Curve #1 in the table below?

STA	GRADE LINE ELEV (GLE)	OFFSET (Ø)	ROAD ELEV.	GROUND ELEV.	CUT OF FILL
				67.00'	
				66.25'	
				67.50'	
				69.00'	
				70.00'	
				70.25'	
				71.25'	
				70.75'	
				69.75'	

RUNWAY LENGTH DETERMINATION
PROCEDURAL OUTLINE

(1) TAKE OFF GROUND RUN

Take-off ground run (TGR) for individual aircraft as shown in Table 12-3 of TM 5-330.

(2) TEMPERATURE CORRECTION

Increase the TGR obtained from the previous step for average temperatures above $59^{\circ}F$ as follows:

a. If the TGR was 5000' or greater, increase the TGR by 7% for each $10^{\circ}F$. $CF_t = \frac{\text{TEMP}-59^{\circ}F}{10^{\circ}F} \times 7\%$

b. If the TGR was less than 5000', increase the TGR by 4% for each $10^{\circ}F$. $CF_t = \frac{\text{TEMP}-59^{\circ}F}{10^{\circ}F} \times 4\%$

(3) ALTITUDE CORRECTION

Increase the corrected runway length by 10% for each 1000' increase in altitude above 1000'.

a. Determine "Pressure Altitude":
ALT = Site Elev + dH (see figure 12-5, TM 5-330)

b. Compute correction factor using "pressure altitude" determined above. $CF_a = \frac{\text{ALT}-1000}{1000} \times 10\%$

(4) EFFECTIVE GRADIENT CORRECTION

Increase the corrected runway length by 8% for each 1% of effective gradient in excess of 2%. $CF_g = \frac{\text{EFF GR}-2\%}{1\%} \times 8\%$

(5) SAFETY FACTOR

For REAR AREA airfields, multiply the corrected runway length by 1.5.
For BATTLE, FORWARD, and SUPPORT airfields, multiply the corrected runway length by 1.25.

(6) ROUND-UP

Round the final corrected runway length UP to the next 100 .

(7) COMPARE WITH MINIMUM

Compare final runway length with the minimum length required. (See Table 12-4, TM 5-330, column #5)
USE THE LARGER LENGTH.

LEAD-THROUGH PRACTICAL EXCERCISE 3

SITUATION: The Corps Engineer has requested an airfield design for a Heavy Lift Airfield in the Corps Zone. The best possible site in the area is at an elevation of 1100 feet. The mean temperature of the hottest month during the service life of the airfield is 85°F. The site gradient of the existing area is 3%. The airfield is to be located in North Carolina.

REQUIREMENT: Determine the runway length required for this airfield.

Annex 1

Student Exercise Packet

1. General

You are the new assistant Battalion S-3 in my S-3 shop. I just received three hot design requirements for the _____&_____ Airfield projects from the _____ Engineer Group. I need accurate solutions by 1240 hours today in order to brief the group S-3 at 1600 hours.

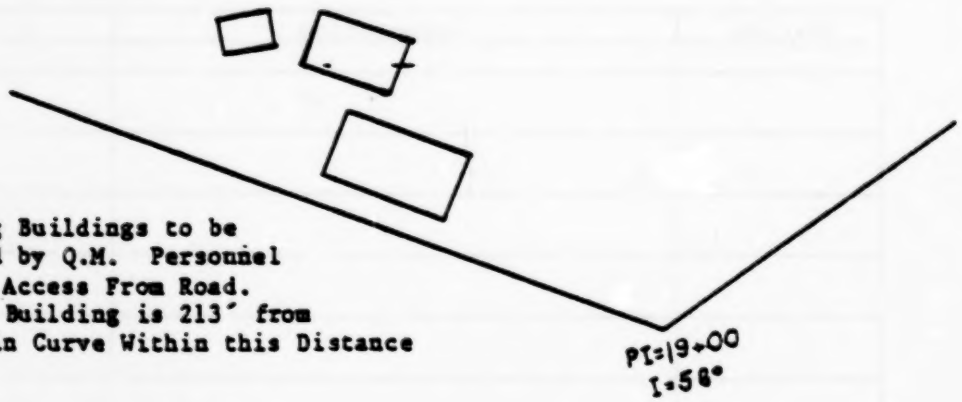
2. Requirement

Attached are the three design problems; return accurate solutions to these problems by 1240 hours today. I will review the problems for accuracy as you finish.

0400 6. Small Group Exercise #1

SITUATION: The buildings shown on the road plan shown below are to be utilized by Quartermaster personnel. The closest building is 213 feet from the PI. To provide proper access from the buildings to the new road, curve must start within this 213 foot distance.

REQUIREMENT 1: Design the Horizontal Curve to the specifications for a military road.



NOTE: Existing Buildings to be
Utilized by Q.M. Personnel
Provide Access From Road.
Nearest Building is 213' from
P.L Begin Curve Within this Distance

REQUIREMENT 2: 0425 Compute the deflection angles and chords required to lay out the HORIZONTAL CURVE

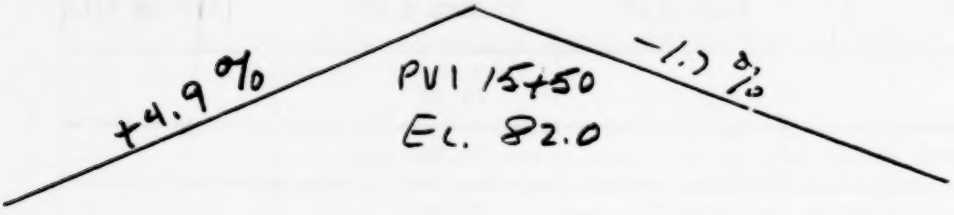
Station	Computation	d

0450 BREAK

0500 SMALL GROUP EXERCISE #2

SITUATION : Given the profile of the road attached it is desired to determine the minimum length of vertical curve with PVI at station 15+50, using the standards of a class B road.

REQUIREMENT 1: Determine length of curve, PVC, PVT, and MO, then compile the data necessary to stake the vertical curves.



0520

STA	GLE	∅	ROAD ELEV.	GROUND ELEV.	CUT OR FILL
				70.00′	
				75.00′	
				78.75′	
				82.00′	
				85.25′	
				87.25′	
				87.25′	
				86.00′	
				84.50′	

0550 BREAK

0540 SMALL GROUP EXERCISE #3

SITUATION: The Engineer Command has requested an airfield design for your area. The design will be for a rear area Army airfield. The elevation for the best available site in your area is 1500 feet. The mean temperatures for the hottest month during the anticipated service life of this airfield is 84°F. The gradient of the site selected is 2.5%. Assume a dH value of 500 feet.

REQUIREMENTS:

1. Determine the runway length.

2. Determine geometric requirements for the runway, taxiway, and apron.

3. Calculate the maximum width of the clear area (from outer edge of runway clear area to the outer edge of the apron clear area) and length between the outer edges of the clear zones in order to brief recon team on area requirements.

CALCULATIONS: (Use this space for your solution.)

1. Runway length

   a. Takeoff Ground Run _____

   b. Temperature Correction _____

   c. Altitude Gradient Correction _____

   d. Effective gradient Correction _____

   e. Safety Factor _____

   f. Round up _____

   g. Minimum Length _____

   h. Design Length _____

2. Geometric Requirements

a. Runway Width _____

b. Shoulder Width _____

c. Clear Area Width _____

d. Lateral Safety Zone (non-taxiway side) _____

e. Overrun Length _____

f. Clear Zone Length _____

f. Clear Zone Inner Width _____

h. Clear Zone Outer Width _____

i. Approach Zone Length _____

j. Approach Zone Inner Width _____

k. Approach Zone Outer Width _____

l. Glide Ratio _____

m. Taxiway Length _____

n. Taxiway Width _____

o. Shoulder Width (TW) _____

p. Clear Area Width (TW) _____

q. Apron Length _____

r. Apron Width _____

s. Apron Lateral Clearance _____

FUNCTIONS OF A 1° CURVE

FUNCTIONS OF A ONE DEGREE CURVE

I		L.C.	M	E	T
0	0	0.000	0.0000	0.0000	0.0000
	10	16.666	0.0060	0.0060	8.3333
	20	33.333	0.0242	0.0242	16.6667
	30	49.999	0.0545	0.0545	25.0001
	40	66.666	0.0969	0.0969	33.3337
	50	83.332	0.1515	0.1515	41.6674
1	0	99.998	0.2181	0.2181	50.0012
	10	116.664	0.2969	0.2969	58.3353
	20	133.330	0.3878	0.3878	66.6696
	30	149.995	0.4908	0.4909	75.0042
	40	166.660	0.6060	0.6060	83.3392
	50	183.325	0.7332	0.7333	91.6744
2	0	199.989	0.8726	0.8727	100.0101
	10	216.653	1.0241	1.0243	108.3462
	20	233.317	1.1877	1.1879	116.6827
	30	249.980	1.3634	1.3638	125.0198
	40	266.642	1.5513	1.5517	133.3574
	50	283.304	1.7513	1.7518	141.6955
3	0	299.965	1.9633	1.9640	150.0342
	10	316.626	2.1875	2.1884	158.3736
	20	333.286	2.4238	2.4249	166.7136
	30	349.945	2.6723	2.6735	175.0544
	40	366.604	2.9328	2.9343	183.3959
	50	383.261	3.2055	3.2073	191.7381
4	0	399.918	3.4903	3.4924	200.0812
	10	416.574	3.7871	3.7896	208.4251
	20	433.230	4.0961	4.0991	216.7700
	30	449.884	4.4172	4.4207	225.1157
	40	466.537	4.7505	4.7544	233.4624
	50	483.190	5.0958	5.1003	241.8100
5	0	499.841	5.4532	5.4584	250.1587
	10	516.491	5.8228	5.8287	258.5085
	20	533.140	6.2044	6.2112	266.8593
	30	549.788	6.5982	6.6058	275.2113
	40	566.435	7.0041	7.0127	283.5645
	50	583.081	7.4221	7.4317	291.9188
6	0	599.725	7.8521	7.8629	300.2744
	10	616.369	8.2943	8.3063	308.6313
	20	633.010	8.7486	8.7620	316.9894
	30	649.651	9.2150	9.2298	325.3490
	40	666.290	9.6935	9.7099	333.7099
	50	682.928	10.1841	10.2022	342.0722
7	0	699.564	10.6868	10.7067	350.4360
	10	716.199	11.2016	11.2235	358.8012
	20	732.832	11.7284	11.7525	367.1680
	30	749.464	12.2674	12.2937	375.5363
	40	766.094	12.8185	12.8472	383.9063
	50	782.723	13.3817	13.4130	392.2778
8	0	799.350	13.9569	13.9910	400.6511
	10	815.975	14.5443	14.5813	409.0260
	20	832.599	15.1437	15.1838	417.4027
	30	849.220	15.7552	15.7987	425.7811
	40	865.840	16.3788	16.4258	434.1614
	50	882.458	17.0145	17.0652	442.5435
9	0	899.075	17.6623	17.7169	450.9275
	10	915.689	18.3222	18.3810	459.3134
	20	932.301	18.9941	19.0573	467.7013
	30	948.912	19.6782	19.7460	476.0912
	40	965.520	20.3743	20.4470	484.4831
	50	982.126	21.0825	21.1603	492.8770

FUNCTIONS OF A ONE DEGREE CURVE

I		L.C.	M	E	T
10	0	998.731	21.8027	21.8860	501.2731
	10	1015.333	22.5351	22.6240	509.6713
	20	1031.933	23.2795	23.3744	518.0716
	30	1048.531	24.0359	24.1372	526.4742
	40	1065.126	24.8045	24.9123	534.8790
	50	1081.720	25.5851	25.6999	543.2861
11	0	1098.311	26.3778	26.4998	551.6956
	10	1114.900	27.1825	27.3121	560.1073
	20	1131.486	27.9993	28.1368	568.5215
	30	1148.070	28.8282	28.9740	576.9381
	40	1164.652	29.6691	29.8236	585.3572
	50	1181.231	30.5221	30.6856	593.7788
12	0	1197.807	31.3872	31.5601	602.2029
	10	1214.382	32.2643	32.4470	610.6295
	20	1230.953	33.1534	33.3464	619.0588
	30	1247.522	34.0546	34.2582	627.4906
	40	1264.088	34.9679	35.1826	635.9254
	50	1280.652	35.8932	36.1194	644.3628
13	0	1297.213	36.8305	37.0688	652.8029
	10	1313.771	37.7799	38.0307	661.2458
	20	1330.326	38.7413	39.0050	669.6916
	30	1346.879	39.7148	39.9920	678.1402
	40	1363.429	40.7003	40.9914	686.5917
	50	1379.975	41.6978	42.0035	695.0462
14	0	1396.519	42.7074	43.0281	703.5037
	10	1413.060	43.7289	44.0653	711.9642
	20	1429.598	44.7626	45.1150	720.4277
	30	1446.133	45.8082	46.1774	728.8943
	40	1462.665	46.8659	47.2524	737.3641
	50	1479.194	47.9356	48.3400	745.8371
15	0	1495.719	49.0173	49.4403	754.3132
	10	1512.242	50.1110	50.5532	762.7926
	20	1528.761	51.2168	51.6787	771.2753
	30	1545.277	52.3345	52.8169	779.7613
	40	1561.790	53.4643	53.9679	788.2507
	50	1578.300	54.6060	55.1315	796.7434
16	0	1594.806	55.7598	56.3078	805.2396
	10	1611.309	56.9256	57.4968	813.7393
	20	1627.808	58.1034	58.6986	822.2425
	30	1644.304	59.2931	59.9132	830.7492
	40	1660.796	60.4949	61.1404	839.2595
	50	1677.285	61.7087	62.3805	847.7735
17	0	1693.771	62.9344	63.6334	856.2911
	10	1710.253	64.1722	64.8990	864.8124
	20	1726.731	65.4219	66.1775	873.3375
	30	1743.205	66.6836	67.4688	881.8663
	40	1759.676	67.9573	68.7730	890.3990
	50	1776.143	69.2429	70.0900	898.9355
18	0	1792.606	70.5406	71.4199	907.4760
	10	1809.066	71.8502	72.7626	916.0203
	20	1825.522	73.1717	74.1183	924.5686
	30	1841.974	74.5053	75.4869	933.1210
	40	1858.422	75.8508	76.8684	941.6774
	50	1874.866	77.2082	78.2629	950.2379
19	0	1891.306	78.5777	79.6703	958.8025
	10	1907.742	79.9590	81.0907	967.3713
	20	1924.174	81.3524	82.5241	975.9443
	30	1940.602	82.7576	83.9705	984.5215
	40	1957.026	84.1749	85.4299	993.1030
	50	1973.445	85.6040	86.9024	1001.6889

TABLE 2 (cont)

	I	FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	T
20	0	1989.861	87.0461	88.3879	1010.2791
	10	2006.272	88.4981	89.8865	1018.8738
	20	2022.680	89.9631	91.3982	1027.4729
	30	2039.082	91.4400	92.9230	1036.0764
	40	2055.481	92.9288	94.4609	1044.6845
	50	2071.875	94.4296	96.0120	1053.2972
21	0	2088.265	95.9423	97.5762	1061.9145
	10	2104.650	97.4669	99.1536	1070.5364
	20	2121.031	99.0034	100.7441	1079.1630
	30	2137.408	100.5518	102.3479	1087.7943
	40	2153.779	102.1121	103.9649	1096.4304
	50	2170.147	103.6843	105.5952	1105.0713
22	0	2186.510	105.2684	107.2387	1113.7171
	10	2202.868	106.8645	108.8955	1122.3677
	20	2219.221	108.4724	110.5656	1131.0233
	30	2235.570	110.0922	112.2490	1139.6839
	40	2251.914	111.7239	113.9458	1148.3494
	50	2268.253	113.3675	115.6559	1157.0201
23	0	2284.588	115.0229	117.3793	1165.6958
	10	2300.917	116.6903	119.1162	1174.3766
	20	2317.242	118.3696	120.8665	1183.0626
	30	2333.562	120.0608	122.6302	1191.7539
	40	2349.877	121.7635	124.4074	1200.4504
	50	2366.187	123.4783	126.1980	1209.1522
24	0	2382.492	125.2050	128.0021	1217.8593
	10	2398.792	126.9435	129.8198	1226.5719
	20	2415.087	128.6939	131.6509	1235.2898
	30	2431.377	130.4561	133.4957	1244.0133
	40	2447.661	132.2302	135.3539	1252.7422
	50	2463.941	134.0161	137.2258	1261.4767
25	0	2480.215	135.8138	139.1113	1270.2168
	10	2496.484	137.6234	141.0105	1278.9625
	20	2512.747	139.4448	142.9232	1287.7140
	30	2529.006	141.2780	144.8497	1296.4711
	40	2545.259	143.1231	146.7899	1305.2340
	50	2561.507	144.9800	148.7438	1314.0027
26	0	2577.749	146.8487	150.7114	1322.7773
	10	2593.986	148.7292	152.6928	1331.5577
	20	2610.217	150.6215	154.6880	1340.3441
	30	2626.443	152.5256	156.6970	1349.1365
	40	2642.663	154.4415	158.7198	1357.9349
	50	2658.877	156.3692	160.7565	1366.7393
27	0	2675.086	158.3086	162.8070	1375.5499
	10	2691.290	160.2599	164.8715	1384.3667
	20	2707.487	162.2230	166.9499	1393.1896
	30	2723.679	164.1978	169.0422	1402.0188
	40	2739.866	166.1844	171.1485	1410.8542
	50	2756.046	168.1828	173.2688	1419.6960
28	0	2772.220	170.1929	175.4031	1428.5442
	10	2788.389	172.2148	177.5515	1437.3988
	20	2804.552	174.2484	179.7139	1446.2598
	30	2820.708	176.2939	181.8905	1455.1274
	40	2836.859	178.3510	184.0811	1464.0015
	50	2853.004	180.4199	186.2859	1472.8822
29	0	2869.143	182.5006	188.5049	1481.7696
	10	2885.276	184.5929	190.7380	1490.6636
	20	2901.402	186.6970	192.9854	1499.5644
	30	2917.523	188.8128	195.2470	1508.4719
	40	2933.637	190.9404	197.5229	1517.3863
	50	2949.746	193.0796	199.8131	1526.3076

	I	FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	T
30	0	2965.847	195.2306	202.1176	1535.2357
	10	2981.943	197.3933	204.4364	1544.1709
	20	2998.032	199.5674	206.7697	1553.1130
	30	3014.115	201.7537	209.1173	1562.0622
	40	3030.192	203.9515	211.4794	1571.0185
	50	3046.262	206.1610	213.8559	1579.9819
31	0	3062.326	208.3821	216.2469	1588.9526
	10	3078.383	210.6149	218.6524	1597.9304
	20	3094.434	212.8594	221.0725	1606.9156
	30	3110.478	215.1156	223.5071	1615.9081
	40	3126.516	217.3834	225.9564	1624.9079
	50	3142.547	219.6629	228.4202	1633.9152
32	0	3158.571	221.9541	230.8987	1642.9300
	10	3174.589	224.2569	233.3919	1651.9523
	20	3190.600	226.5713	235.8998	1660.9822
	30	3206.604	228.8974	238.4224	1670.0196
	40	3222.601	231.2352	240.9598	1679.0648
	50	3238.592	233.5845	243.5121	1688.1177
3	0	3254.576	235.9455	246.0791	1697.1783
	10	3270.553	238.3181	248.6610	1706.2467
	20	3286.522	240.7023	251.2578	1715.3230
	30	3302.485	243.0981	253.8695	1724.4072
	40	3318.442	245.5056	256.4961	1733.4994
	50	3334.391	247.9246	259.1378	1742.5995
34	0	3350.332	250.3553	261.7944	1751.7077
	10	3366.267	252.7975	264.4661	1760.8241
	20	3382.195	255.2513	267.1529	1769.9485
	30	3398.116	257.7167	269.8548	1779.0812
	40	3414.029	260.1937	272.5718	1788.2221
	50	3429.935	262.6822	275.3040	1797.3714
35	0	3445.834	265.1823	278.0514	1806.5290
	10	3461.726	267.6940	280.8140	1815.6949
	20	3477.610	270.2172	283.5919	1824.8694
	30	3493.487	272.7519	286.3851	1834.0523
	40	3509.357	275.2982	289.1936	1843.2438
	50	3525.219	277.8561	292.0175	1852.4439
36	0	3541.073	280.4255	294.8568	1861.6527
	10	3556.921	283.0064	297.7115	1870.8702
	20	3572.760	285.5988	300.5817	1880.0964
	30	3588.592	288.2027	303.4674	1889.3314
	40	3604.417	290.8182	306.3686	1898.5753
	50	3620.234	293.4451	309.2855	1907.8281
37	0	3636.043	296.0836	312.2179	1917.0899
	10	3651.845	298.7335	315.1659	1926.3607
	20	3667.638	301.3950	318.1297	1935.6406
	30	3683.424	304.0679	321.1091	1944.9296
	40	3699.203	306.7523	324.1043	1954.2278
	50	3714.973	309.4482	327.1153	1963.5352
38	0	3730.736	312.1556	330.1421	1972.8519
	10	3746.490	314.8743	333.1848	1982.1779
	20	3762.237	317.6046	336.2434	1991.5133
	30	3777.976	320.3463	339.3179	2000.8582
	40	3793.707	323.0994	342.4083	2010.2125
	50	3809.430	325.8640	345.5148	2019.5764
39	0	3825.144	328.6400	348.6373	2028.9499
	10	3840.851	331.4274	351.7759	2038.3331
	20	3856.550	334.2263	354.9306	2047.7260
	30	3872.240	337.0366	358.1015	2057.1287
	40	3887.922	339.8582	361.2886	2066.5411
	50	3903.596	342.6913	364.4919	2075.9635

TABLE 2 (cont)

I		FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	T
40	0	3919.262	345.5358	367.7115	2085.3958
	10	3934.919	348.3916	370.9474	2094.8381
	20	3950.568	351.2589	374.1997	2104.2904
	30	3966.209	354.1375	377.4683	2113.7529
	40	3981.841	357.0275	380.7534	2123.2255
	50	3997.465	359.9289	384.0550	2132.7083
41	0	4013.081	362.8416	387.3731	2142.2014
	10	4028.687	365.7657	390.7077	2151.7048
	20	4044.286	368.7011	394.0590	2161.2186
	30	4059.876	371.6478	397.4268	2170.7429
	40	4075.457	374.6059	400.8114	2180.2776
	50	4091.030	377.5753	404.2127	2189.8229
42	0	4106.594	380.5561	407.6307	2199.3789
	10	4122.149	383.5481	411.0656	2208.9455
	20	4137.696	386.5515	414.5173	2218.5228
	30	4153.234	389.5662	417.9859	2228.1110
	40	4168.763	392.5921	421.4715	2237.7100
	50	4184.283	395.6294	424.9740	2247.3199
43	0	4199.794	398.6779	428.4935	2256.9407
	10	4215.297	401.7377	432.0302	2266.5726
	20	4230.790	404.8088	435.5839	2276.2156
	30	4246.275	407.8912	439.1548	2285.8698
	40	4261.751	410.9848	442.7429	2295.5351
	50	4277.217	414.0896	446.3482	2305.2118
44	0	4292.675	417.2057	449.9709	2314.8997
	10	4308.123	420.3331	453.6109	2324.5991
	20	4323.563	423.4716	457.2682	2334.3099
	30	4338.993	426.6214	460.9430	2344.0322
	40	4354.414	429.7825	464.6353	2353.7661
	50	4369.826	432.9547	468.3451	2363.5116
45	0	4385.229	436.1381	472.0725	2373.2689
	10	4400.622	439.3327	475.8175	2383.0379
	20	4416.006	442.5385	479.5802	2392.8187
	30	4431.381	445.7556	483.3605	2402.6114
	40	4446.746	448.9837	487.1587	2412.4161
	50	4462.102	452.2231	490.9746	2422.2328
46	0	4477.448	455.4736	494.8085	2432.0615
	10	4492.785	458.7353	498.6602	2441.9024
	20	4508.113	462.008	502.5299	2451.7555
	30	4523.431	465.2920	506.4176	2461.6209
	40	4538.739	468.5871	510.3234	2471.4986
	50	4554.038	471.8934	514.2473	2481.3888
47	0	4569.327	475.2107	518.1893	2491.2914
	10	4584.607	478.5392	522.1496	2501.2065
	20	4599.877	481.8788	526.1281	2511.1342
	30	4615.137	485.2294	530.1249	2521.0746
	40	4630.387	488.5912	534.1401	2531.0277
	50	4645.627	491.9641	538.1738	2540.9936
48	0	4660.858	495.3480	542.2259	2550.9724
	10	4676.079	498.7430	546.2965	2560.9641
	20	4691.290	502.1491	550.3857	2570.9689
	30	4706.491	505.5662	554.4936	2580.9866
	40	4721.682	508.9944	558.6201	2591.0176
	50	4736.863	512.4336	562.7654	2601.0617
49	0	4752.034	515.8839	566.9295	2611.1191
	10	4767.195	519.3452	571.1124	2621.1898
	20	4782.346	522.8175	575.3143	2631.2740
	30	4797.487	526.3008	579.5351	2641.3716
	40	4812.617	529.7951	583.7749	2651.4828
	50	4827.738	533.3006	588.0338	2661.6076

I		FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	
50	0	4842.848	536.8168	592.3118	2671.7460
	10	4857.948	540.3441	596.6090	2681.3983
	20	4873.038	543.8824	600.9255	2692.0644
	30	4888.117	547.4316	605.2612	2702.2444
	40	4903.186	550.9919	609.6164	2712.4383
	50	4918.245	554.5630	613.9909	2722.6463
51	0	4933.293	558.1452	618.3850	2732.8685
	10	4948.331	561.7382	622.7985	2743.1048
	20	4963.359	565.3422	627.2317	2753.3554
	30	4978.375	568.9571	631.6845	2763.6203
	40	4993.382	572.5830	636.1571	2773.8995
	50	5008.378	576.2197	640.6494	2784.1935
52	0	5023.363	579.8674	645.1616	2794.5019
	10	5038.337	583.5259	649.6936	2804.8249
	20	5053.301	587.1953	654.2456	2815.1626
	30	5068.255	590.8756	658.8177	2825.5151
	40	5083.197	594.5668	663.4098	2835.8825
	50	5098.129	598.2688	668.0221	2846.2648
53	0	5113.050	601.9817	672.6546	2856.6622
	10	5127.960	605.7055	677.3074	2867.0746
	20	5142.859	609.4400	681.9805	2877.5022
	30	5157.748	613.1854	686.6740	2887.9450
	40	5172.625	616.9417	691.3880	2898.4032
	50	5187.492	620.7087	696.1225	2908.8767
54	0	5202.347	624.4866	700.8777	2919.3658
	10	5217.192	628.2752	705.6535	2929.8703
	20	5232.026	632.0747	710.4500	2940.3906
	30	5246.848	635.8849	715.2673	2950.9265
	40	5261.660	639.7059	720.1055	2961.4783
	50	5276.460	643.5377	724.9644	2972.0459
55	0	5291.249	647.3802	729.8448	2982.6295
	10	5306.027	651.2335	734.7459	2993.2291
	20	5320.793	655.0975	739.6683	3003.8448
	30	5335.549	658.9722	744.6118	3014.4767
	40	5350.293	662.8577	749.5766	3025.1250
	50	5365.026	666.7539	754.5628	3035.7896
56	0	5379.747	670.6608	759.5704	3046.4706
	10	5394.457	674.5785	764.5995	3057.1682
	20	5409.156	678.5068	769.6501	3067.8824
	30	5423.843	682.4458	774.7224	3078.6133
	40	5438.519	686.3954	779.8163	3089.3609
	50	5453.183	690.3558	784.9321	3100.1255
57	0	5467.836	694.3268	790.0697	3110.9070
	10	5482.477	698.3084	795.2292	3121.7059
	20	5497.107	702.3007	800.4107	3132.5221
	30	5511.725	706.3036	805.6143	3143.3561
	40	5526.331	710.3172	810.8401	3154.2079
	50	5540.926	714.3413	816.0880	3165.0778
58	0	5555.509	718.3761	821.3583	3175.9659
	10	5570.080	722.4215	826.6509	3186.8725
	20	5584.639	726.4775	831.9660	3197.7978
	30	5599.187	730.5440	837.3036	3208.7420
	40	5613.722	734.6212	842.6638	3219.6737
	50	5628.246	738.7088	848.0467	3230.6474
59	0	5642.758	742.8071	853.4523	3241.6392
	10	5657.258	746.9159	858.8808	3252.6491
	20	5671.746	751.0352	864.3323	3263.6772
	30	5686.222	755.1651	869.8067	3274.7236
	40	5700.686	759.3055	875.3042	3285.7883
	50	5715.138	763.4564	880.8248	3296.8714

TABLE 2 (cont)

I		FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	T
60	0	5729.578	767.6178	986.3688	3307.9734
	10	5744.005	771.7898	891.9360	3319.0938
	20	5758.421	775.9722	897.5260	3330.2330
	30	5772.824	780.1650	903.1408	3341.3911
	40	5787.215	784.3684	908.7785	3352.5681
	50	5801.594	788.5822	914.4398	3363.7641
61	0	5815.961	792.8065	920.1249	3374.9793
	10	5830.315	797.0412	925.8339	3386.2137
	20	5844.657	801.2863	931.5667	3397.4675
	30	5858.987	805.5419	937.3236	3408.7407
	40	5873.304	809.8079	943.1045	3420.0334
	50	5887.609	814.0843	948.9096	3431.3457
62	0	5901.901	818.3710	954.7390	3442.6777
	10	5916.181	822.6682	960.5927	3454.0296
	20	5930.448	826.9758	966.4709	3465.4014
	30	5944.703	831.2937	972.3736	3476.7932
	40	5958.945	835.6220	978.3009	3488.2052
	50	5973.175	839.9606	984.2529	3499.6374
63	0	5987.392	844.3096	990.2297	3511.0899
	10	6001.596	848.6689	996.2314	3522.5628
	20	6015.788	853.0386	1002.2581	3534.0563
	30	6029.967	857.4185	1008.3099	3545.5704
	40	6044.133	861.8088	1014.3868	3557.1053
	50	6058.286	866.2094	1020.4890	3568.6610
64	0	6072.427	870.6202	1026.6166	3580.2376
	10	6086.555	875.0414	1032.7696	3591.8354
	20	6100.670	879.4728	1038.9482	3603.4543
	30	6114.771	883.9144	1045.1524	3615.0944
	40	6128.860	888.3663	1051.3823	3626.7560
	50	6142.936	892.8285	1057.6381	3638.4391
65	0	6157.000	897.3009	1063.9198	3650.1437
	10	6171.050	901.7835	1070.2276	3661.8701
	20	6185.086	906.2763	1076.5615	3673.6182
	30	6199.110	910.7793	1082.9215	3685.3884
	40	6213.121	915.2925	1089.3081	3697.1805
	50	6227.119	919.8159	1095.7210	3708.9948
66	0	6241.103	924.3495	1102.1604	3720.8314
	10	6255.074	928.8933	1108.6265	3732.6904
	20	6269.032	933.4471	1115.1194	3744.5718
	30	6282.977	938.0112	1121.6390	3756.4759
	40	6296.909	942.5854	1128.1857	3768.4027
	50	6310.827	947.1697	1134.7594	3780.3523
67	0	6324.732	951.7641	1141.3602	3792.3249
	10	6338.623	956.3686	1147.9883	3804.3206
	20	6352.501	960.9832	1154.6438	3816.3394
	30	6366.365	965.6080	1161.3268	3828.3816
	40	6380.217	970.2427	1168.0374	3840.4472
	50	6394.054	974.8876	1174.7757	3852.5363
68	0	6407.878	979.5425	1181.5418	3864.6491
	10	6421.689	984.2075	1188.3358	3876.7857
	20	6435.486	988.8825	1195.1578	3888.9462
	30	6449.269	993.5675	1202.0080	3901.1308
	40	6463.039	998.2626	1208.8865	3913.3395
	50	6476.795	1002.9676	1215.7933	3925.5724
69	0	6490.537	1007.6827	1222.7286	3937.8298
	10	6504.265	1012.4077	1229.6925	3950.1117
	20	6517.980	1017.1427	1236.6852	3962.4183
	30	6531.681	1021.8877	1243.7066	3974.7496
	40	6545.369	1026.6427	1250.7570	3987.1059
	50	6559.042	1031.4076	1257.8365	3999.4872

I		FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	T
70	0	6572.701	1036.1824	1264.9452	4011.8937
	10	6586.347	1040.9672	1272.0831	4024.3254
	20	6599.979	1045.7619	1279.2505	4036.7826
	30	6613.596	1050.5665	1286.4475	4049.2653
	40	6627.200	1055.3810	1293.6741	4061.7738
	50	6640.790	1060.2053	1300.9305	4074.3080
71	0	6654.365	1065.0396	1308.2168	4086.8682
	10	6667.927	1069.8837	1315.5331	4099.4545
	20	6681.474	1074.7377	1322.8797	4112.0670
	30	6695.008	1079.6015	1330.2565	4124.7059
	40	6708.527	1084.4752	1337.6637	4137.3713
	50	6722.032	1089.3587	1345.1014	4150.0633
72	0	6735.522	1094.2520	1352.5698	4162.7820
	10	6748.999	1099.1551	1360.0691	4175.5277
	20	6762.461	1104.0680	1367.5992	4188.3004
	30	6775.909	1108.9907	1375.1604	4201.1004
	40	6789.343	1113.9232	1382.7528	4213.9276
	50	6802.762	1118.8654	1390.3765	4226.7823
73	0	6816.167	1123.8174	1398.0317	4239.6646
	10	6829.557	1128.7791	1405.7185	4252.5747
	20	6842.933	1133.7506	1413.4370	4265.5127
	30	6856.294	1138.7317	1421.1873	4278.4788
	40	6869.641	1143.7225	1428.9696	4291.4730
	50	6882.974	1148.7232	1436.7841	4304.4956
74	0	6896.292	1153.7335	1444.6309	4317.5467
	10	6909.595	1158.7535	1452.5100	4330.6264
	20	6922.884	1163.7831	1460.4217	4343.7349
	30	6936.158	1168.8224	1468.3662	4356.8723
	40	6949.417	1173.8713	1476.3434	4370.0388
	50	6962.662	1178.9299	1484.3536	4383.2346
75	0	6975.892	1183.9981	1492.3970	4396.4598
	10	6989.107	1189.0759	1500.4736	4409.7145
	20	7002.307	1194.1633	1508.5836	4422.9989
	30	7015.493	1199.2604	1516.7272	4436.3132
	40	7028.664	1204.3670	1524.9045	4449.6576
	50	7041.819	1209.4831	1533.1156	4463.0321
76	0	7054.960	1214.6089	1541.3608	4476.4369
	10	7068.086	1219.7442	1549.6401	4489.8722
	20	7081.198	1224.8890	1557.9537	4503.3382
	30	7094.294	1230.0433	1566.3018	4516.8350
	40	7107.375	1235.2072	1574.6845	4530.3628
	50	7120.441	1240.3806	1583.1020	4543.9218
77	0	7133.492	1245.5635	1591.5544	4557.5121
	10	7146.528	1250.7558	1600.0419	4571.1338
	20	7159.549	1255.9577	1608.5647	4584.7872
	30	7172.554	1261.1690	1617.1228	4598.4725
	40	7185.545	1266.3897	1625.7165	4612.1897
	50	7198.520	1271.6199	1634.3459	4625.9390
78	0	7211.480	1276.8595	1643.0113	4639.7207
	10	7224.425	1282.1086	1651.7126	4653.5348
	20	7237.354	1287.3670	1660.4502	4667.3818
	30	7250.269	1292.6349	1669.2242	4681.2615
	40	7263.167	1297.9121	1678.0347	4695.1743
	50	7276.051	1303.1987	1686.8819	4709.1202
79	0	7288.919	1308.4947	1695.7660	4723.0996
	10	7301.772	1313.8000	1704.6872	4737.1125
	20	7314.609	1319.1147	1713.6455	4751.1591
	30	7327.431	1324.4387	1722.6413	4765.2397
	40	7340.237	1329.7720	1731.6747	4779.3543
	50	7353.028	1335.1146	1740.7458	4793.5033

TABLE 2 (cont)

I		FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	T
80	0	7365.803	1340.4666	1749.8648	4807.4867
	10	7378.563	1345.8278	1759.0020	4821.9048
	20	7391.307	1351.1982	1768.1874	4836.1578
	30	7404.035	1356.5780	1777.4113	4850.4458
	40	7416.748	1361.9670	1786.6738	4864.7690
	50	7429.445	1367.3652	1795.9751	4879.1276
81	0	7442.126	1372.7727	1805.3155	4893.5219
	10	7454.792	1378.1893	1814.6950	4907.9519
	20	7467.441	1383.6152	1824.1140	4922.4180
	30	7480.075	1389.0503	1833.5725	4936.9202
	40	7492.694	1394.4945	1843.0707	4951.4589
	50	7505.296	1399.9480	1852.6089	4966.0341
82	0	7517.882	1405.4105	1862.1872	4980.6461
	10	7530.453	1410.8823	1871.8059	4995.2951
	20	7543.007	1416.3631	1881.4651	5009.9814
	30	7555.546	1421.8531	1891.1650	5024.7050
	40	7568.069	1427.3522	1900.9058	5039.4662
	50	7580.575	1432.8604	1910.6878	5054.2653
83	0	7593.066	1438.3777	1920.5111	5069.1024
	10	7605.541	1443.9041	1930.3758	5083.9777
	20	7617.999	1449.4395	1940.2823	5098.8914
	30	7630.441	1454.9840	1950.2308	5113.8438
	40	7642.868	1460.5376	1960.2213	5128.8351
	50	7655.278	1466.1001	1970.2542	5143.8655
C4	0	7667.672	1471.6717	1980.3296	5158.9352
	10	7680.049	1477.2523	1990.4478	5174.0443
	20	7692.411	1482.8419	2000.6090	5189.1933
	30	7704.756	1488.4405	2010.8133	5204.3822
	40	7717.084	1494.0480	2021.0610	5219.6113
	50	7729.397	1499.6645	2031.3524	5234.8808
85	0	7741.693	1505.2899	2041.6875	5250.1909
	10	7753.973	1510.9243	2052.0668	5265.5419
	20	7766.236	1516.5676	2062.4902	5280.9340
	30	7778.483	1522.2199	2072.9582	5296.3674
	40	7790.714	1527.8810	2083.4709	5311.8423
	50	7802.928	1533.5510	2094.0285	5327.3591
86	0	7815.125	1539.2299	2104.6313	5342.9179
	10	7827.306	1544.9176	2115.2795	5358.5189
	20	7839.470	1550.6142	2125.9733	5374.1625
	30	7851.618	1556.3197	2136.7129	5389.8487
	40	7863.749	1562.0339	2147.4987	5405.5780
	50	7875.864	1567.7570	2158.3308	5421.3505
87	0	7887.962	1573.4889	2169.2094	5437.1665
	10	7900.043	1579.2296	2180.1349	5453.0261
	20	7912.108	1584.9791	2191.1074	5468.9298
	30	7924.155	1590.7373	2202.1272	5484.8777
	40	7936.186	1596.5043	2213.1945	5500.8700
	50	7948.201	1602.2800	2224.3096	5516.9071
88	0	7960.198	1608.0645	2235.4727	5532.9891
	10	7972.179	1613.8576	2246.6841	5549.1164
	20	7984.142	1619.6595	2257.9440	5565.2892
	30	7996.089	1625.4701	2269.2527	5581.5077
	40	8008.019	1631.2894	2280.6104	5597.7723
	50	8019.932	1637.1173	2292.0174	5614.0832
89	0	8031.828	1642.9539	2303.4740	5630.4406
	10	8043.707	1648.7991	2314.9804	5646.8448
	20	8055.569	1654.6530	2326.5369	5663.2961
	30	8067.414	1660.5154	2338.1437	5679.7949
	40	8079.242	1666.3865	2349.8011	5696.3412
	50	8091.053	1672.2662	2361.5094	5712.9355

I		FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	T
90	0	8102.846	1678.1545	2373.2689	5729.5780
	10	8114.623	1684.0513	2385.0797	5746.2689
	20	8126.382	1689.9567	2396.9423	5763.0084
	30	8138.125	1695.8707	2408.8568	5779.7974
	40	8149.849	1701.7931	2420.8236	5796.6355
	50	8161.557	1707.7241	2432.8430	5813.5232
91	0	8173.248	1713.6636	2444.9151	5830.4609
	10	8184.921	1719.6116	2457.0404	5847.4487
	20	8196.577	1725.5681	2469.2190	5864.4871
	30	8208.215	1731.5331	2481.4514	5881.5763
	40	8219.836	1737.5065	2493.7377	5898.7166
	50	8231.440	1743.4883	2506.0783	5915.9083
92	0	8243.026	1749.4786	2518.4734	5933.1517
	10	8254.595	1755.4773	2530.9235	5950.4471
	20	8266.147	1761.4845	2543.4286	5967.7948
	30	8277.681	1767.5000	2555.9893	5985.1952
	40	8289.197	1773.5238	2568.6057	6002.6486
	50	8300.696	1779.5561	2581.2783	6020.1552
93	0	8312.178	1785.5967	2594.0072	6037.7154
	10	8323.641	1791.6457	2606.7929	6055.3295
	20	8335.088	1797.7030	2619.6355	6072.9978
	30	8346.516	1803.7686	2632.5355	6090.7207
	40	8357.927	1809.8425	2645.4932	6108.4985
	50	8369.320	1815.9247	2658.5089	6126.3316
94	0	8380.696	1822.0152	2671.5829	6144.2201
	10	8392.053	1828.1139	2684.7156	6162.1646
	20	8403.393	1834.2209	2697.9072	6180.1653
	30	8414.716	1840.3361	2711.1581	6198.2225
	40	8426.020	1846.4596	2724.4687	6216.3367
	50	8437.307	1852.5913	2737.8393	6234.5081
95	0	8448.576	1858.7312	2751.2702	6252.7371
	10	8459.826	1864.8792	2764.7617	6271.0241
	20	8471.059	1871.0355	2778.3143	6289.3694
	30	8482.274	1877.1999	2791.9283	6307.7734
	40	8493.472	1883.3724	2805.6040	6326.2364
	50	8504.651	1889.5531	2819.3417	6344.7588
96	0	8515.812	1895.7419	2833.1419	6363.3410
	10	8526.955	1901.9389	2847.0049	6381.9833
	20	8538.080	1908.1439	2860.9311	6400.6861
	30	8549.187	1914.3570	2874.9208	6419.4497
	40	8560.276	1920.5782	2888.9743	6438.2747
	50	8571.347	1926.8074	2903.0922	6457.1612
97	0	8582.400	1933.0447	2917.2747	6476.1098
	10	8593.435	1939.2900	2931.5223	6495.1208
	20	8604.451	1945.5433	2945.8352	6514.1945
	30	8615.449	1951.8047	2960.2140	6533.3315
	40	8626.429	1958.0740	2974.6589	6552.5320
	50	8637.391	1964.3513	2989.1704	6571.7964
98	0	8648.334	1970.6366	3003.7489	6591.1255
	10	8659.259	1976.9298	3018.3948	6610.5192
	20	8670.166	1983.2309	3033.1084	6629.9780
	30	8681.055	1989.5400	3047.8902	6649.5025
	40	8691.925	1995.8570	3062.7406	6669.0931
	50	8702.777	2002.1819	3077.6600	6688.7500
99	0	8713.610	2008.5147	3092.6488	6708.4739
	10	8724.425	2014.8554	3107.7074	6728.2650
	20	8735.221	2021.2039	3122.8363	6748.1238
	30	8745.999	2027.5602	3138.0359	6768.0508
	40	8756.759	2033.9244	3153.3066	6788.0464
	50	8767.500	2040.2964	3168.6488	6808.1110

TABLE 2 (cont)

I		FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	T
100	0	8778.222	2046.6762	3184.0630	6828.2451
	10	8788.926	2053.0638	3199.5496	6848.4491
	20	8799.611	2059.4592	3215.1090	6868.7235
	30	8810.278	2065.8623	3230.7418	6889.0687
	40	8820.926	2072.2732	3246.4484	6909.4852
	50	8831.555	2078.6918	3262.2291	6929.9734
101	0	8842.166	2085.1182	3278.0846	6950.5339
	10	8852.758	2091.5522	3294.0151	6971.1670
	20	8863.331	2097.9940	3310.0213	6991.8733
	30	8873.886	2104.4434	3326.1035	7012.6532
	40	8884.421	2110.9006	3342.2623	7033.5072
	50	8894.938	2117.3653	3358.4982	7054.4358
102	0	8905.436	2123.8377	3374.8115	7075.4395
	10	8915.916	2130.3177	3391.2029	7096.5188
	20	8926.376	2136.8054	3407.6727	7117.6742
	30	8936.817	2143.3006	3424.2215	7138.9062
	40	8947.240	2149.8034	3440.8498	7160.2152
	50	8957.644	2156.3138	3457.5581	7181.6019
103	0	8968.028	2162.8318	3474.3469	7203.0667
	10	8978.394	2169.3573	3491.2167	7224.6101
	20	8988.741	2175.8903	3508.1681	7246.2327
	30	8999.069	2182.4309	3525.2015	7267.9350
	40	9009.377	2188.9789	3542.3174	7289.7175
	50	9019.667	2195.5345	3559.5165	7311.5808
104	0	9029.938	2202.0975	3576.7993	7333.5254
	10	9040.189	2208.6680	3594.1662	7355.5518
	20	9050.421	2215.2459	3611.6179	7377.6607
	30	9060.635	2221.8313	3629.1548	7399.8525
	40	9070.829	2228.4241	3646.7777	7422.1278
	50	9081.004	2235.0243	3664.4869	7444.4873
105	0	9091.159	2241.6319	3682.2830	7466.9314
	10	9101.294	2248.2468	3700.1667	7489.4607
	20	9111.413	2254.8692	3718.1386	7512.0759
	30	9121.511	2261.4988	3736.1991	7534.7775
	40	9131.589	2268.1358	3754.3489	7557.5661
	50	9141.648	2274.7802	3772.5886	7580.4423
106	0	9151.688	2281.4318	3790.9187	7603.4068
	10	9161.709	2288.0908	3809.3400	7626.4600
	20	9171.710	2294.7570	3827.8529	7649.6027
	30	9181.692	2301.4305	3846.4581	7672.8354
	40	9191.654	2308.1112	3865.1562	7696.1588
	50	9201.597	2314.7992	3883.9479	7719.5736
107	0	9211.521	2321.4944	3902.8337	7743.0802
	10	9221.425	2328.1968	3921.8143	7766.6795
	20	9231.309	2334.9064	3940.8904	7790.3720
	30	9241.174	2341.6232	3960.0626	7814.1584
	40	9251.019	2348.3472	3979.3315	7838.0393
	50	9260.845	2355.0783	3998.6979	7862.0155
108	0	9270.651	2361.8165	4018.1623	7886.0875
	10	9280.438	2368.5619	4037.7254	7910.2561
	20	9290.205	2375.3143	4057.3880	7934.5220
	30	9299.952	2382.0739	4077.1507	7958.8859
	40	9309.680	2388.8406	4097.0142	7983.3483
	50	9319.388	2395.6143	4116.9792	8007.9102
109	0	9329.076	2402.3951	4137.0464	8032.5721
	10	9338.745	2409.1829	4157.2166	8057.3347
	20	9348.393	2415.9777	4177.4903	8082.1989
	30	9358.022	2422.7796	4197.8685	8107.1653
	40	9367.632	2429.5884	4218.3517	8132.2347
	50	9377.221	2436.4042	4238.9407	8157.4078

I		FUNCTIONS OF A ONE DEGREE CURVE L.C.	M	E	T
110	0	9386.791	2443.2270	4259.6364	8182.6854
	10	9396.340	2450.0568	4280.4393	8208.0681
	20	9405.870	2456.8934	4301.3504	8233.5569
	30	9415.380	2463.7370	4322.3703	8259.1525
	40	9424.870	2470.5875	4343.4998	8284.8556
	50	9434.340	2477.4450	4364.7398	8310.6671
111	0	9443.790	2484.3092	4386.0909	8336.5877
	10	9453.220	2491.1804	4407.5541	8362.6182
	20	9462.630	2498.0584	4429.1301	8388.7595
	30	9472.020	2504.9432	4450.8197	8415.0123
	40	9481.390	2511.8349	4472.6237	8441.3776
	50	9490.740	2518.7333	4494.5430	8467.8561
112	0	9500.070	2525.6386	4516.5784	8494.4487
	10	9509.380	2532.5506	4538.7308	8521.1562
	20	9518.670	2539.4694	4561.0010	8547.9795
	30	9527.939	2546.3950	4583.3899	8574.9194
	40	9537.189	2553.3272	4605.8983	8601.9769
	50	9546.418	2560.2662	4628.5271	8629.1529
113	0	9555.627	2567.2119	4651.2773	8656.4480
	10	9564.816	2574.1643	4674.1497	8683.8635
	20	9573.985	2581.1234	4697.1451	8711.4001
	30	9583.133	2588.0891	4720.2644	8739.0587
	40	9592.261	2595.0615	4743.5091	8766.8404
	50	9601.369	2602.0405	4766.8795	8794.7459
114	0	9610.456	2609.0261	4790.3767	8822.7764
	10	9619.524	2616.0183	4814.0017	8850.9327
	20	9628.570	2623.0171	4837.7554	8879.2157
	30	9637.597	2630.0225	4861.6389	8907.6266
	40	9646.603	2637.0345	4885.6531	8936.1663
	50	9655.588	2644.0529	4909.7990	8964.8357
115	0	9664.554	2651.0779	4934.0776	8993.6359
	10	9673.498	2658.1095	4958.4899	9022.5679
	20	9682.423	2665.1475	4983.0370	9051.6328
	30	9691.327	2672.1920	5007.7198	9080.8315
	40	9700.210	2679.2429	5032.5395	9110.1651
	50	9709.073	2686.3003	5057.4970	9139.6348
116	0	9717.915	2693.3642	5082.5935	9169.2415
	10	9726.737	2700.4345	5107.8300	9198.9863
	20	9735.538	2707.5112	5133.2077	9228.8704
	30	9744.318	2714.5942	5158.7275	9258.8948
	40	9753.078	2721.6837	5184.3907	9289.0607
	50	9761.818	2728.7795	5210.1984	9319.3692
117	0	9770.536	2735.8817	5236.1516	9349.8215
	10	9779.234	2742.9902	5262.2516	9380.4186
	20	9787.911	2750.1050	5288.4995	9411.1618
	30	9796.568	2757.2261	5314.8964	9442.0523
	40	9805.204	2764.3535	5341.4436	9473.0912
	50	9813.819	2771.4872	5368.1423	9504.2797
118	0	9822.413	2778.6271	5394.9937	9535.6191
	10	9830.987	2785.7733	5421.9989	9567.1105
	20	9839.540	2792.9257	5449.1593	9598.7553
	30	9848.072	2800.0843	5476.4761	9630.5547
	40	9856.583	2807.2491	5503.9505	9662.5100
	50	9865.073	2814.4201	5531.5839	9694.6224
119	0	9873.542	2821.5973	5559.3775	9726.8932
	10	9881.991	2828.7806	5587.3326	9759.3238
	20	9890.419	2835.9701	5615.4506	9791.9155
	30	9898.825	2843.1657	5643.7327	9824.6696
	40	9907.211	2850.3673	5672.1804	9857.5875
	50	9915.576	2857.5751	5700.7950	9890.6704

* U.S. Government Printing Office : 1985 -480-644/32588